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TULANE UNIVERSITY OF LOUISIANA.

Oak Street
UNCLASSIFIED

COLLEGE OF TECHNOLOGY

COURSE IN SUGAR ENGINEERING.

CIRCULAR OF INFORMATION.

NEW ORLEANS, LA.
PUBLISHED BY THE UNIVERSITY.

[1897]

COLLEGE OF TECHNOLOGY.

FACULTY.

WILLIAM PRESTON JOHNSTON, LL. D., President.
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WILLIAM H. P. CREIGHTON, U. S. N., Professor of Mechanical Engineering.
WILLIAM B. SMITH, A. M., PH. D., Professor of Mathematics.
JOHN W. CALDWELL, A. M., M. D., Professor of Chemistry and Geology.
LEVI W. WILKINSON, M. SC., Professor of Sugar Chemistry.
WILLIAM WOODWARD (Mass. Normal Art School), Professor of Drawing, and of Architecture.
ROBERT SHARP, M. A., PH. D., Professor of English.
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WILLIAM B. GREGORY, M. E., Assistant Professor of Experimental Engineering and Mechanism.
WILLIAM P. BROWN, A. M., Assistant Professor of English.
H. F. RUGAN, Assistant Professor of Mechanic Arts.
B. PALMER CALDWELL, A. B., CH. E., Instructor in Chemistry.
TUDOR T. HALL, Mechanician in Physical Laboratory.
HERMANN F. HUSTEDT, Engineer.

GENERAL REMARKS.

The College of Technology of Tulane University of Louisiana is devoted to the higher education of young men in Engineering. It gives thorough instruction, leading to appropriate degrees, in Mechanical. Electrical, Chemical, Civil, and Architectural Engineering, and in the Chemistry and Engineering of Sugar Making. The aim is to develop an engineering college on the most approved modern lines, but with features of plan and detail especially suited to the industrial conditions and prospects of the South. The courses of study have been carefully planned with the object of fitting young men who graduate in these courses to take a prominent part in the development of the great natural resources of this section. The method of instruction is such as to give reality to the knowledge of the student in every course, and a large amount of time is given to work in the drawing rooms, the workshops, the laboratories and the field.

LOCATION.

The University now occupies its new buildings in the most popular and rapidly growing suburb of New Orleans, far enough removed from the centre of the city to be free from its distractions, and yet easily and quickly reached by three lines of electric cars. The location is most admirable in every way, and the proximity of large shops, factories, mills, refineries, electric plants, etc., affords advantages for practical study not to be obtained in smaller places.

BUILDINGS.

The buildings are modern, handsome and carefully planned for their respective uses. They are heated by steam from a central boiler house, and electrically lighted. The main building, or "Gibson Hall," is occupied by the offices, library, museum, literary societies, and class-rooms for languages, mathematics, and historical and philosophical subjects. The Physical Laboratory, Chemical Laboratory, and the large group of engineering laboratories and workshops, are used for the purposes indicated by their titles. The laboratories and workshops are well adapted to the work to be done in them, and will compare favorably in every respect with the best similar buildings in the country.

EQUIPMENT.

The equipment of apparatus, machines and models in Physics, Chemistry, Mechanical Engineering, Civil Engineering, Electrical Engineering, Industrial Chemistry and Architecture is already quite extensive, and is being rapidly increased by purchase, by donation and by the operations of the workshops. In Physics, laboratory work is a prominent feature, and the facilities, both in building and apparatus, are believed to be the best in any Southern college. In Chemistry, both General and Industrial, great advance has recently been made in the erection and furnishing of the new laboratory building. In this, special and adequate facilities are provided for the study of sugar chemistry. In Civil Engineering, the collection of instruments, etc., is good, and is being constantly added to; and there is a small but well equipped observatory, for practical astronomy. In Drawing and Architecture, there are a large number of casts and examples of architectural details in plaster, terra cotta and metals, as well as complete outfits for work in clay modeling and wood carving. In Electrical Engineering, the equipment is very fine, there being in all about twenty dynamos for direct and alternating incandescent and arc service. They are driven by a Reynolds-Corliss engine, belted to a shaft, from which the machines are operated by friction clutch pulleys. The switchboards are of marble and slate, and there is a large collection of arc lamps, converters and measuring instruments.

In Mechanical Engineering, there are available for study five steam engines (Corliss, slide and piston valve), an Otto gas engine, a Rider hot-air engine, four steam pumps, a Westinghouse air brake, Wheeler condenser, Riehle Brothers' 100,000 pounds testing machine, Riehle Brothers' 2000 pounds cement tester, brake and transmission dynamometers, calorimeters, gauges, and a considerable amount of smaller apparatus. The workshops are unusually good, the equipment being quite full for work in carpentry, pattern making, wood turning, chipping, filing, blacksmithing, moulding and casting in iron, and machine work in metals. They are undoubtedly without a peer in the South. The drawing rooms for machine, steam engine and boiler design are equipped with large drawing tables, and there is a considerable and rapidly increasing collection of blue prints, photographs and catalogues presented by leading manufacturers.

COURSES OF STUDY.

In the College of Technology there are five courses, as follows:

1. Mechanical Engineering (including Electrical Engineering).
2. Chemical Engineering.
3. Sugar Engineering.
4. Civil Engineering.
5. Architectural Engineering.

Each of these courses extends over four years, and on the successful completion of any one of them a diploma is awarded conferring the degree of Bachelor of Engineering in the particular course followed by the student. Opportunities are offered for the further prosecution of studies in the line of any course, on the completion of which advanced study the degree of Engineer is conferred.

Since the fundamental principles underlying the subject matters of all the courses are the same, the first two years' work is substantially identical for all students. The courses diverge materially in the Junior year, and within the several courses there is opportunity for such diversity of special studies that the needs of any student can be easily met.

The **Mechanical Engineering** course is substantially the same as the similar course at the best technical colleges of the country. In it we aim to fit students to deal intelligently with problems in the design and management of machinery, and the production and distribution of power. Electrical engineering, now so attractive a field for students, is included in this course.

The **Chemical Engineering** course aims to combine a training in the principles of machinery and power production with a thorough knowledge of Chemistry, both general and industrial. In it we hope to train young men who shall be especially well qualified to undertake the direction of the manufacture of sugar, of cotton and other textile fabrics, of oils, glycerine, soaps, paper, alcohol, fertilizers, or other things that will utilize the products of our own section.

The **Sugar Engineering** course differs from the Chemical Engineering course mainly in that in it the attention of the student is directed more especially and continually to the chemistry of the sugars and other related bodies, and to the principles governing the design, proper erection and economical management of a sugar factory, and of the machinery contained therein. In the furtherance of this object the student is trained both in the chemistry of clarification and chemical control of the processes and in the setting up, repair and proper handling of the boilers, pumps, engines, dynamos, centrifugals, multiple effects, and other machinery of a modern sugar making plant.

The **Civil Engineering** course embraces the subjects that will place the graduate in a position to deal with questions of road and railway construction, levee building and land surveying, as well as drainage, sewerage and other problems in municipal sanitation and economy.

The **Architectural Engineering** course attempts a combination of the art and structural sides of architecture, and in the latter side the course is similar to that in Civil Engineering. While the successful architect must be a good constructor and superintendent, he must also be well trained in the æsthetic side of his profession, that he may discharge his function of a public educator to the appreciation of the beautiful.

Further information in regard to any of the above courses may be obtained by addressing the Secretary of the University, or the Dean of the College.

COURSE IN SUGAR ENGINEERING.

Realizing the importance of the sugar industry to the section in which the University is located, and desiring to aid, as far as practicable, in the improvement of that industry through the better training of those who have it in charge, the Administrators of the University have decided to establish, as one of the regular courses of the College of Technology, a course in Sugar Engineering. This course is to be one in which both the mechanical and chemical sides of the manufacture of sugar shall receive adequate attention, and yet one in which the general training and culture of the student is not to be neglected. Hence, in the course of study, due attention is paid to linguistic, historical and philosophical subjects, and the arrangement of the course is such that the study of such subjects is a help rather than a hindrance to the principal subjects of the College. The Sugar Engineering, like the other collegiate courses of the University, will extend over four years, at the end of which the student will be graduated with the degree of Bachelor of Engineering in the Sugar Engineering course.

SPECIAL COURSES

will, however, be arranged for mature and earnest persons, whether they be actually engaged during the grinding season in the work of the plantation or refinery, or are desirous of fitting themselves for engaging in such work in a manner and with a preparation to ensure success. Every advantage possessed by the University will be offered to such persons, so far as is consistent with the regularly scheduled work.

OUTLINE OF THE SUGAR ENGINEERING COURSE.

The outline given below is of the regular four years course. Special students follow such of the subjects as are appropriate for them. The numbers refer to hours per week. In the estimates of time, two hours of shop, laboratory, drawing-room or field work are counted as equivalent to one hour of recitation.

Freshman.

FALL: Carpentry, 3; Free Hand Drawing, 3; French, 4; Algebra and Geometry, 5; Rhetoric, 4; Technical Instruction, 1.
WINTER: Forging, 3; Free Hand Drawing, 3; Mechanical Drawing, 3; French, 4; Algebra and Geometry, 5; Rhetoric, 4; Technical Instruction, 1.
SPRING: Wood Turning and Pattern Making, 2; Foundry Practice, 1; Mechanical Drawing, 3; Trigonometry, 5; Rhetoric, 4; French, 4; Technical Instruction, 1.

Sophomore.

FALL: Vise and Machine Work, 3; Descriptive Geometry, 3; French, 4; Elementary Mechanics, 3; Co-ordinate Geometry, 3; Determinants, 2; English, 3.
WINTER: Vise and Machine Work, 3; Descriptive Geometry, 3; Co-ordinate Geometry, 5; Elementary Chemistry, 2; Chemical Laboratory, 3; English, 3.
SPRING: Infinitesimal Calculus, 5; Vise and Machin Work, 3; Elementary Physics, 2; Physical Laboratory, 3; Machine Drawing, 3; English, 3.

The course as given above for the first two years is common to all the engineering courses. We are, perhaps, better fitted to give the shop instruction than any institution in the South. The introduction to Physics and Chemistry in the Sophomore class is by a combination of class room and laboratory work, and is thoroughly well worked out. The instruction in Descriptive Geometry and Drawing is according to the most improved methods. Drawings are never copied, but worked out from original sketches and measurements taken by the student himself from actual machines.

Junior.

FALL: General Physics, 3; Physical Laboratory, 3; General Chemistry, 4; Chemical Laboratory, 2; Infinitesimal Calculus, 5; English History, 3.
WINTER: General Physics, 3; Physical Laboratory, 3; General Chemistry, 4; Chemical Laboratory, 2; Organic Chemistry, 2; Analytical Mechanics, 5; American History, 3.
SPRING: Quantitative Analysis, 4; Polarized Light and the Polariscope, 2; Agricultural Chemistry, 2; Physiological Chemistry, 2; Strength of Materials, 5; Testing Laboratory, 1; German, 3; Surveying and Leveling, 2.

The work in Physics and Chemistry in this year is of a more advanced character and is along lines, both in the lecture room and laboratory, corresponding to the similar work at the best colleges in the country. The work in Organic Chemistry is intended to give the student a comprehensive view of the Carbon compounds. The work in Agricultural Chemistry embraces the classification, composition, fertilization and improvement of soils, with special reference to cane and beet culture. The course in Physiological Chemistry gives a brief account of the physiological functions of the elements entering into the composition of plants, and theories of the formation of the sugars and other carbohydrates. The work on the polariscope is intended to give a thorough knowledge of the principles underlying the operation of the instrument, so that the student will be fully able to overhaul and adjust properly the instrument when in need of it. The work in the Strength of Materials is of great value as training and for information, and is made very practical by means of the large fifty-ton testing machine in the laboratory.

Senior.

FALL: Chemistry of the Carbohydrates, Chemistry of Clarification and Sugar-making, 3; Sugar-making Machinery, 3; Steam Engine and Thermodynamics, 4; Engine Practice and Testing, 2; Civics, 5; German, 3; Pipe Cutting and Fitting, 1; Spanish (optional).

WINTER: Steam Boilers, 3; Machine Design, with special reference to sugar house machinery, 3; Sugar Analysis and Chemical Control of the Sugar House, 5; Economics, 5; German, 3; Spanish (optional).

SPRING: Steam Boiler Practice and Testing, 3; Machine Design (sugar house machinery), 3; Sugar Chemistry (continued), 5; Electrical Engineering (practice with electric light machinery and motors and wiring), 3; German, 5; Spanish (optional).

The work of the Senior year is almost entirely devoted to subjects bearing directly on sugar-making. The chemical work is directed so as to cover all questions that ordinarily arise in the conduct of a sugar house. The work in steam engineering is made very practical by use of the considerable steam plant (boilers, engines, pumps, etc.,) of the University, and these are subjected to such accurate tests that the student is put in a position to determine for himself whether the steam plant of any sugar house is being operated to the best advantage, both as to efficiency and economy. The work with electric machines is sufficient to familiarize the student with all the types of machines ordinarily met with on a plantation or in a refinery. The proper wiring for safety and economy is also taught.

It will be noticed that in the course outlined above sufficient time is given to French and German to enable the student to consult the standard works on sugar making, or other engineering subjects, in those languages. Spanish, while not required in the course, is offered as an optional study, and is recommended to those that are able to take it, on account of the close relations of the sugar industry to the Spanish-speaking countries.

PRACTICAL WORK.

An examination of the foregoing scheme will show that the course is not narrowed to the technical subjects alone, but there is a considerable amount of time given to linguistic, economic and philosophical subjects. We believe that this is proper in every respect. In here considering in some detail the work in the shops, laboratories, drawing-rooms and field, our object is simply to lay stress on the special work that is characteristic of this College, and to do which we are well prepared. The following statements are of work actually done by the students during the past session.

WORKSHOPS.

The work extends through the Freshman, Sophomore and part of the Junior year. Exactness and method are required throughout. All work is to scale, and the drawings and blue prints are made by the students.

Carpentry. A series of exercises in planing, sawing, rabbeting, ploughing, paneling, splicing, mortising, tenoning, dovetailing and other work involving the common carpenter tools.

Wood Turning and Pattern Making. Exercises in turning cylindrical, spherical, and other curved surfaces. Exercises in pattern making, including patterns and cores for columns, pipes, pipe joints, pulleys and gears.

Forging. Iron forging includes exercises in heating, bending, drawing, upsetting, welding, annealing and case hardening. Steel forging includes the making and tempering of punches, chisels, machine cutting tools, gravers and springs.

Vise and Machine Work. Exercises in vise work, including chipping, key seating, filing to size, round filing, scraping, grinding valve seats. Machine work in metals includes exercises in turning, planing, slotting, drilling, thread cutting, pipe cutting.

Exercises must be within .01 inch, and finished work within .001 inch.

Foundry. Exercises in green sand moulding, making cores, running, charging and care of cupola, pouring of castings.

In addition to a large amount of practice work, the following are a few of the articles made in the various shops during the past session:

Steam engines, oil testing machine, balance beam, crane brackets, grate bars, floor plates, engine brake, standard plug and hole gauges, calorimeters, repairs of rack teeth, dynamo castings, etc.

MECHANICAL ENGINEERING LABORATORY.

The following is an outline of work in this laboratory:

Strength of Materials.—Testing boiler steel; deflection of beams; strengthof columns; calibration of heavy springs; compressive strength of cast iron, brass, bricks, marble, cements, etc. The extensometer is used in connection with these tests for finding moduli of elasticity.

Tests of Oils.—Determinations of density, viscosity, flash point, burning point, and acid tests. Lubricating qualities with oil testing machine.

Steam Engine Tests.—Correction of valve setting; determination of water consumption; indicated horse-power; efficiency; calibration of indicators, steam gauges, vacuum gauges, thermometers, planimeters; use of separating and throttling calorimeters; Prony, strap and other brakes.

Steam Boiler Tests.--Capacity and efficiency tests of boilers; flue gas analysis; practice in operating and repairing boilers.

Hot Air and Gas Engine tests; study of belt friction: study of pumps and water wheels, injectors, etc.

Design of steam boilers of various types, design of single, compound, triple expansion, Corliss and automatic engines, sugar mills, centrifugals, vacuum pans, multiple effects, etc.

Kinematics.—Design of machine elements; spur and bevel gearing; cams to convey motion at various speeds and in variable directions; cone pulleys; epicycle trains; clock mechanisms and straight line motions.

LABORATORY OF SUGAR CHEMISTRY.

In the department of General Chemistry a course is given in qualitative and quantitative analysis, and the preparation and analysis of organic compounds. In the Laboratory of Sugar Chemistry, the work is as follows:

Study of alcohol, aldehydes, acids, ketones, ethers, amines, amides, etc., with especial reference to their relations to the sugars.

Analyses of fertilizers, soils, food stuffs, fuels, ash of sugar cane.

The carbohydrates: their effects on polarized light; their compounds with acids and bases.

Effect of mineral and organic acids on the carbohydrates in the presence of heat.

Effect of oxidation reagents on the carbohydrates.

Special study of alcoholic, acetic, lactic and butyric fermentation on the sugars and other carbohydrates.

Hydrolysis, and melassigenic action of mineral and organic bodies.

Processes of clarification: carbonatation process; Steffen's process, sulphuring and liming; lead sucrate process; strontium process; electrolytic processes.

Bleaching of molasses.

Isolation of sucrose, lactose, maltose, raffinose, dextrose, dextrin, levulose, galactose, and special study of the specific rotatory powers.

Practice in analyzing unknown mixtures of the above sugars, of cane juice, syrup, masse cuite, sugars, molasses, "glucose syrup," sugar cane, bagasse, and beets.

In order to carry out the different methods of clarification, the laboratory is furnished with experimental apparatus and machinery and with electricity. The student makes a careful analysis of the materials under consideration before and after clarification, and compares the results to ascertain the effect of the process under investigation. Students will have an opportunity to visit some of the best equipped sugar houses in the State, and observe clarification on a large scale.

ELECTRICAL ENGINEERING LABORATORY.

The collection of dynamo machines and motors in this laboratory is the best in any Southern college. The student will therefore have ample opportunity to get a sufficient knowledge for his purpose without difficulty. To those especially interested in electrical engineering fuller information will be furnished on application.

FIELD WORK IN SURVEYING AND LEVELING.

Sufficient practice with surveying instrumrnts and plotting results will be given students in the Sugar Engineering Course to enable them to properly lay off land, drains, etc.

DRAWING.

Practice in drawing in some form is carried through the whole course. The student is taught free hand and mechanical drawing, according to the best modern methods. In his machine drawing, he in no case copies drawings already made, but makes his drawings entirely from sketches and dimensions taken by him from actual machines. He makes his own tracings and blue prints. In the higher work in machine design he calculates the proportions and strength of every part of the machine under consideration. In this way he becomes entirely independent and self-reliant in the use of this important art.

CONDITIONS OF ADMISSION.

Applicants for admission to the Freshman Class must not be less than sixteen years of age. They will be examined in English (Grammar and Composition, see p. 61 of the general catalogue); Mathematics (Algebra, through Quadratics and Plane Geometry); History (United States and General History to the Middle Ages); and *either* Latin (four books of Cæsar and four orations of Cicero), or French (reading of simple prose at sight), or German (reading of simple prose at sight).

From certain affiliated schools, named in the general catalogue, students are received on certificate. Graduates or advanced students from other reputable colleges will be credited with work actually done by them when certificates are filed from the proper officers of the college. Young men of maturity and purpose who are unable to undertake the full course in any subject may be received, at the discretion of the Faculty, as special students. Every one is urged to apply for this privilege only as a last resort, as the full course is necessary for satisfactory results.

Special courses in Sugar Chemistry and Engineering will be arranged for persons engaged on sugar plantations during the grinding season. No requirement other than general fitness to profit by the work will be made of such students.

EXPENSES.

The tuition fee is $105 per session of eight and a half months, with small charges for material used in the shops and laboratories. Fees for special students are arranged to suit each case. Board and lodging may be obtained at from $20 to $25 per month in approved boarding-houses or private families.

SCHOLARSHIPS.

The University grants about one hundred and seventy-five scholarships in collegiate departments, which are filled by nomination from the State Senators and Representatives, the Mayor of New Orleans and the Board of Administrators of the University. These give free tuition, but admit only students prepared to enter one of the regular courses of the University.

TESTS FOR THE PUBLIC.

We will do a limited amount of work for the public in testing materials of construction, engines, boilers, electric plants and machines, and in analyses of commercial products. The object in receiving such work will be largely to bring material into the laboratories for the instruction of our students, but we also desire to be of use in this way to the business community. During the past session a good deal of such work has been done, including a test of a part of the Louisiana Electric Light Plant, a full test of the power house and car equipments of the Orleans Street Railroad Company, New Orleans, several tests of boiler plants, and a large number of tests of cements and other materials. A small fee will be charged for such work. Full information in regard to it can be had from the Dean of the College.

VISITORS.

Visitors to the University are always welcome, and will be given every opportunity to inspect its buildings, equipment and methods.

ATTENDANCE.

During the session of 1895-96 there have been in the various departments of the University the following numbers of students:

University Department of Philosophy and Science		22
University Department for Teachers		62
College of Arts and Sciences		98
College of Technology		59
H. Sophie Newcomb Memorial College	96	
Newcomb Academy	76	
Art and Special Students	77	—249
Law Department		75
Medical Department		375
Total		940

For catalogues, or general information in regard to the University, address Wm. O. Rogers, Secretary. For special information in regard to the course in Sugar Chemistry and Sugar Engineering, or other work of the College of Technology, address

PROFESSOR BROWN AYRES,
DEAN.

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